

10.3.2 User Newsletter

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This is the ninth issue of the user newsletter for 10.3.2. It's been over a year since the eighth, so it's high time for another issue.

Publications

We're starting to see more publications come out, as work started a couple of years ago makes it through the pipeline. One paper which users will find handy for reference is the descriptive one on the beamline, which is: "Beamline 10.3.2 at ALS: a hard X-ray microprobe for environmental and materials sciences", Matthew A. Marcus, Alastair A. MacDowell, Richard Celestre, Alain Manceau, Tom Miller, Howard A. Padmore and Robert E. Sublett, *J. Synchrotron Rad.* (2004) **11**,239-247. Unfortunately, the editor didn't like the large amounts of software and system-integration description I had put in there, so I had to chop it. Thus, the version posted on the beamline website is different from the published one. Still, the publication is what you should reference in any papers coming out of this beamline. The DOE acknowledgement in the paper (posted and published versions) is what should go on your papers.

Thanks to all who have helped me keep the ALS publication database up to date. It really is important in convincing the Powers That Be that the beamline is productive.

I've also got a scientific paper in press at GCA: "Mn, Fe, Zn and As speciation in a fast-growing ferromanganese marine nodule", Matthew A. Marcus, Alain Manceau and Michael Kersten, *Geochimica et Cosmochimica* (2004) *in press*. My name is also on a couple more which are in the mill.

Changes

Jamie, the associate beamline scientist we hired last year, is now pretty much off 10.3.2. He's working on several other projects. Sirine Fakra, whom most of you have met, spends part of her time here and part on other lines, such as 11.3.1. She has been very helpful in assisting users while I was away.

One big change is that the long-threatened loss of space to PEEM3 is happening. As I write this, the hutch door is being replaced by a sliding door. The six cabinets downstream of the beamline all have to go. The samples, etc. will live in a cabinet across from the stairs. Other parts will be in the hutch or in a cabinet far upstream, by M1. The diffraction computer is now on the same KVM switch as UXAS_DATA. To get at it, hit <Alt>,<Ctrl>,<Shift>,2,<Enter> in that order. To switch back, <Alt>,<Ctrl>,<Shift>,1,<Enter>. The sample-prep table will be where I've been keeping my laptop, and my laptop ("office") is where the diffraction computer used to be. The under-stair desk is still the user desk. The bookshelf is gone, replaced by a space atop a short cabinet and some other space next to the beam pipe. Lots of old catalogs and manuals for gizmos we don't have anymore have been trashed. This plan is still somewhat tentative. Right now, it's a big mess here as we're trying to squeeze years of accumulated stuff into a small space. Those who have run on 7.3.3 will understand. Due to this space crunch, it will be more difficult to cram four users plus myself onto the beamline than it has been. You'll need to think about how to manage the bodies so that the beamline is crewed but not over-crowded.

While the PEEM3 beamline itself won't go in until the winter, some racks are slated to come in this summer, so that's when the walkway shifts. I'm working on the space crunch now so that the bulk of the work is done before users arrive.

During this shutdown, we're going to hook up the Codling slit motor on M4, the horizontal-focus mirror. This should let us eliminate the horizontal "ghost" beam, as the M2 and M3 Codling slits did to the vertical. Also, in the time between when the beamline is back in action after the shutdown and when users come in, I hope to try out the use of the Codling slits to reduce the spot size. I don't know how far I can go, how well I can measure it, or how stable it will be, but I do know that some projects require at least mapping at micron resolution.

The oxygen leak system mentioned in the last newsletter is in and it works. For the first time, I don't have any plan to replace or clean M2 during the shutdown. The removal of the water-cooling lines seems to have worked as well. Sometimes, the best improvements are made by removing things instead of adding them. However, we still do get drifts of energy calibration, which might be related to hutch temperature.

Since the last newsletter, we've had a MAR CCD on the beamline, on loan from 7.3.3, gave it back, got a slow Bruker SMART2000, and will shortly do the Detector Shuffle again, getting a SMART6000, which is the same kind of detector which produced the image in last year's newsletter. I only hope that the 6000 reads out faster than the 2000, which takes 20 seconds to read.

For diffraction, we no longer use the bolt-head beamstop shown in last year's newsletter. Instead, we have a copper rod with a small YAG on the end of it, backed with Pb. This is smaller and easier to position than the old bolt. Also, the detector is

now on a Bosch-rail slide, which makes it easier to pull in and out of the beam path. For larger d-spacings, we have a secondary beamstop, which consists of a tungsten wire which can be placed close to but downstream of the sample. This stop minimizes air scatter, which is important for the poorly-crystallized materials we often encounter. We also use alumina powder as a calibrator instead of LaB_6 . The fine powder gives smoother rings and seems to work better.

I'm trying to go in with a couple of neighboring beamlines on arranging for LN2 drops to replace the dewars we now have for detector filling. This would eliminate the need to make sure the dewar gets changed out when empty, which can be a problem over long weekends.

Where's the flux?

We have long known that the flux on this beamline is lower than theory says it should be. James Glossinger re-did the theory calculation and got the discrepancy down to 3x. I intend to redo the measurements, if there's time. This is one of the reasons why I left a few days between the end of 'BLC' (Beamline commissioning) time and the start of user operations.

If there is still a discrepancy, where is it? Jamie and I have designed a calorimeter which goes on the stick where the PIN diode is, before the hutch, and will let us measure the total power incident on the optics. This will tell us whether the problem is in the last 3 meters of beamline or the other 27.

Schedule

Even though it's a long cycle, we're full up. In addition to users who came in through the usual proposal channels, we have some people who are here on a trial basis, to see if they want to become regular users. Some other people just need a shift or two to run standards. We're even using much of the 2-bunch time! We also have spillover this cycle, for reasons I don't really want to get into. Even so, our overbooking was actually pretty minimal this cycle, a fact which causes some management concern. This relative lack of overbooking is due to several reasons, including the cycle being extended to 7 months, some people graduating, some forgetting to re-apply, and some being scared off by tales of overbooking! **Reminder: You have to reapply for beamtime even if your proposal is still active if you want any for an upcoming cycle!**

I'll try to remember to post the new schedule to the website.

Potential Upgrades (Begging Again)

After canvassing users for their opinions about what the beamline needs to stay useful and competitive, I have come to the conclusion that there are basically two, maybe three upgrade paths, which could be embodied by different beamlines:

1. Low-medium energies

This would be an in-place upgrade of 10.3.2 including fixing the factor of 3(?) in flux, and extending the energy range down. The extension would involve a new monochromator and mechanics which would allow switching between the two. The new mono would have YB₆₆ or InSb crystals to get down at least to Si. In order to take advantage of these low energies, we would need a low-energy capable detector either

replacing the present 7-element Ge or somehow sharing space with it. There would also need to be some sort of permanent He chamber around the sample area so that it would not be necessary to spend hours constructing a beam bag, only to find out that there's still an Ar edge sitting on your Cl EXAFS.

2. High energies (superbend)

This would be an all-new beamline, concentrating more on the higher energies, which would allow easy access to Pb, Br, As, Se, Hg, U,... It would go to 20keV. The optics would be new, and probably involve a monochromator before the virtual-source-defining slits.

3. Both ends (Superconducting undulator/wiggler)

This is a dark-horse possibility brought up by Howard Padmore. It is theoretically possible to make an insertion device which would go up to ~12-15keV at ALS. If so, this could form the source for a new beamline which wouldn't go quite as high as the superbend, but high enough to cover some interesting elements.

In order to drum up support for doing any of these things, I'm organizing a user-meeting workshop on "New directions in hard X-ray microspectroscopy and spectromicroscopy". Please attend!